EPA United States Environmental Protection Agency

Air and Radiation (6202J)

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APPLICATION PROFILE

Daylight Switching in Interior Spaces

EPA Green Lights
an ENERGY STAR program

Alta Bates Medical Center

Alta Bates Medical Center
Berkeley, California

Energy Analyst:
Joe Reiger

PROJECT RESULTS

Energy Savings	50%
Installed Cost	$1,985
Internal Rate of Return	120%
Simple Payback	0.8 years
Annual kWh Savings	28,562 kWh
Pollution Prevented	
CO_2	28,562 lbs/yr
SO_2	69 lbs/yr
NO_x	94 lbs/yr

TYPICAL APPLICATIONS

- Hallways
- Lobbies
- Entrance Foyers
- Cafeterias

DAYLIGHT SWITCHING

Automatic Light Switching Based on Available Daylight

Daylight switching is not new to the lighting industry. For years, street lights have been controlled by photocells, automatically turning on the lights at dusk and off at dawn. Other common daylight switching applications include exterior walkway and building facade lighting. However, *interior* applications of daylight switching have been few in number.

There are many spaces in buildings where daylight switching systems can be installed without compromising aesthetics or visual performance. Common applications include lobbies, hallways, and entrances. These areas are prime candidates for daylight switching due to their long hours of operation during the daytime. With high savings potential and relatively low installed costs, daylight switching systems generally yield rapid financial returns.

The daylight switching system should have a "deadband" and time delay. A deadband and time delay are needed to avoid frequent cycling of the lamps due to varying light levels. In addition, a proper deadband and time delay will minimize distraction to the occupants associated with switching the lights on and off. The figure on the following page illustrates how a switching system works with an effective deadband.

Benefits

- Daylight switching systems can reduce lighting operating hours up to 50 percent; reduced air-conditioning requirements can add to these savings.
- Daylight switching systems can yield significant savings in electricity demand (kW) charges because daylight is readily available during periods of peak electricity demand. Demand cost savings could exceed energy cost savings.
- The low cost of daylight switching systems yields fast paybacks.
- Daylight switching can be integrated with the building's energy management system.
- Daylight sensors may control dual-switching circuits; half of the lamps may be turned off when adequate daylight is available.

Issues

- Use only in common areas where people will not object to the lights being off, such as in spaces where occupants stay for only a brief period.
- Energy and demand savings can widely vary based on weather conditions, building orientation, interior decorations and other obstacles which could block daylight from entering.
- The system must be commissioned immediately after installation and annually maintained. Due to varying site conditions, daylight sensors must be properly positioned, adjusted and tuned for the best response to individual zone conditions. Check with the sensor manufacturer for proper calibration methods.

MANUFACTURERS OF SWITCHING CONTROLS

- Conik Technologies
- Crownlight Manufacturing
- Control Systems International
- Dark to Light
- Etta Industries
- Finelite
- Genlyte
- Lightscience Corporation
- Lithonia
- Lutron Electronics
- MicroLite Corporation
- PLC-Multipoint
- Pass & Seymour
- Powerline Communications
- RAB Electric Manufacturing
- Sensor Switch
- TORK Inc.
- Thomas Lighting
- Watt Stopper

Call the Green Lights Hotline at 1-888-STAR-YES for addresses and phone numbers of Green Lights Allies.

CASE STUDY

Alta Bates
MEDICAL CENTER

Walking through the hallways of the Alta Bates Medical Center, one will notice the bright daylight flooding the perimeter corridors. Joe Reiger, Director of Engineering, also noticed the availability of daylight and realized the savings potential in turning the fluorescent lights off.

To eliminate this unnecessary lighting operation, Alta Bates installed a daylight switching system. Although the fluorescent system is already very efficient with T8 lamps and electronic ballasts, the switching system provides an additional 50 percent in energy savings — an excellent example of "taking the next step" beyond T8s and electronic ballasts.

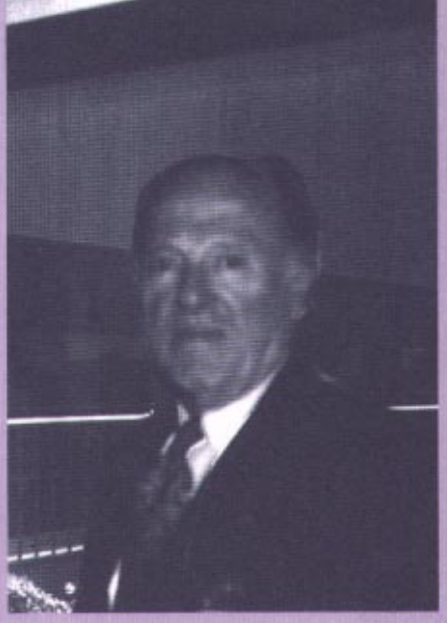
A total of 18 photocells were installed to control 93 fluorescent fixtures covering about 3,000 square feet. Using in-house electricians to install the photocells, the installed cost was only 66¢ per square foot.

Joe estimates that the switching system reduces the lighting operation from 24 hours per day to 12 hours per day, thus slashing the energy consumption in half. This energy reduction results in annual energy savings of $2,570 — over 85¢ per square foot per year. The total savings over the life expectancy of the photocells will add up to over $50,000.

In addition to the energy savings, Joe likes not having to rely on staff members or a timeclock to control the lighting, and over the past fifteen years has had no problems with the photocells.

Facility Information:

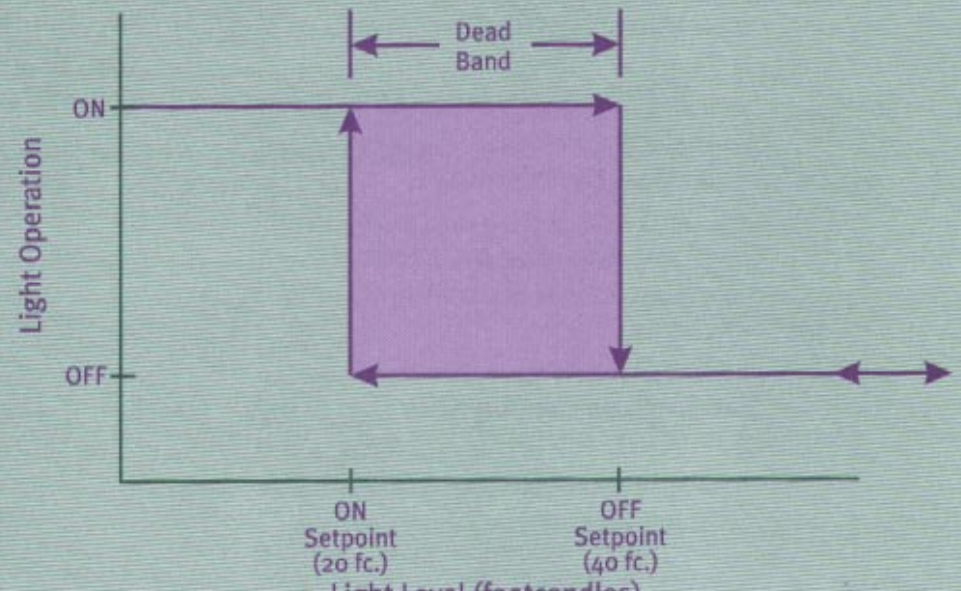
3,000 square feet (hallways)
93 fixtures
18 photocells
Two T8 lamps per luminaire
Lights operated 24 hours per day
One ballast per fixture



"The installed cost of each photocell is so minimal that using them is a no-brainer."

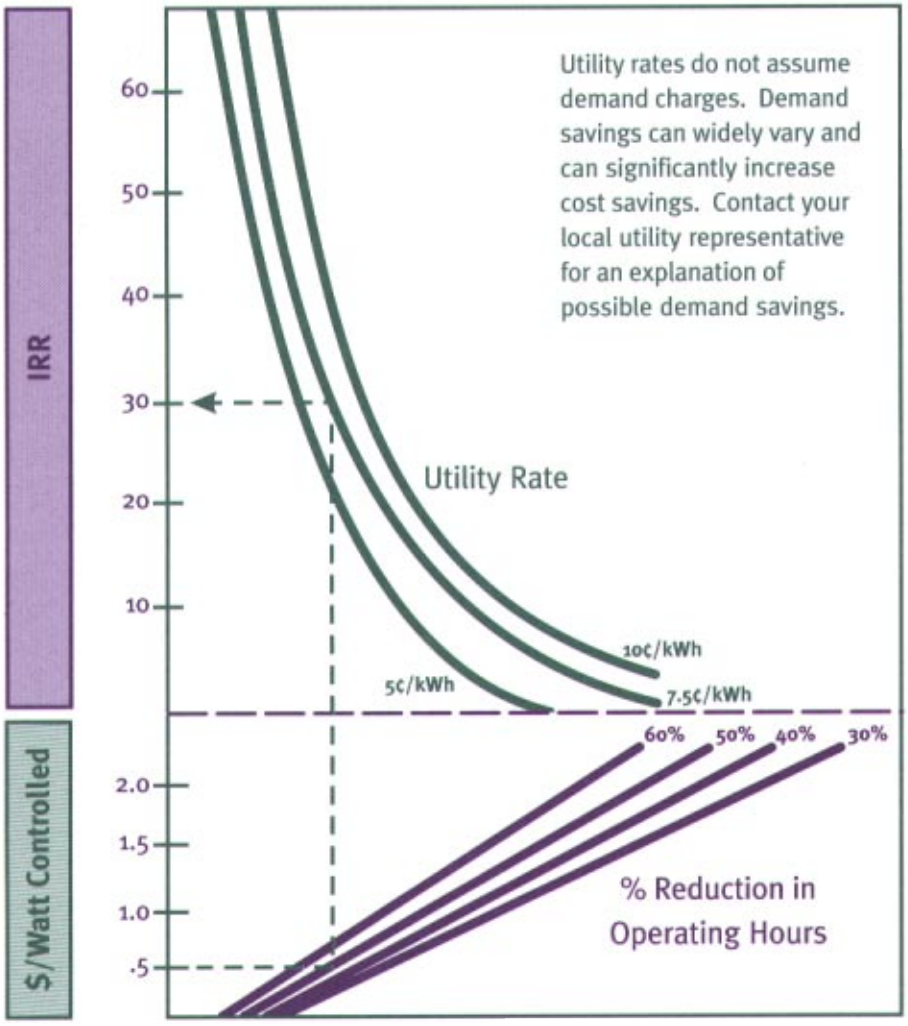
- Joe Reiger
Director of Engineering Services

Dead-Band Photocell Switching Performance (Target Light Level: 20f.c.)



WILL IT WORK FOR YOU?

COST ANALYSIS FOR DAYLIGHT SWITCHING SYSTEMS



Use this graph to estimate the cost-effectiveness of installing daylight dimming systems in your facility.

1. Determine your installed cost of the switching system per watt controlled and mark this point on the graph. *For example, a $2,000 installed cost for controlling a 4,000-watt (four kW) lighting load would be $0.50/watt.*
2. Draw a horizontal line from this point until it intersects the curve that represents the estimated percentage reduction in lighting operation due to daylight switching. *For our example, we estimate a 50% reduction in operating hours will result after installing daylight switching.*
3. Draw a vertical line from this point until it intersects the curve that represents your average electricity rate. *In our example, the electricity rate is 7.5 cents per kilowatt-hour.*
4. Draw a horizontal line from this point until it intersects the vertical axis that measures the internal rate of return. *Our sample upgrade earns an after-tax internal rate of return of 30 percent.*

The Green Lights Program offers 2-day Lighting Upgrade Workshops, Application Profile brochures, and other technical support services to assist program participants in applying cost-saving lighting strategies. For more information, call the Green Lights Hotline at 1-888-STAR-YES.

Graph Assumptions

- Post-tax analysis: marginal income tax rate of 30 percent
- 3% inflation
- No demand savings
- Half of cost ($/watt controlled) is for materials, half is for labor